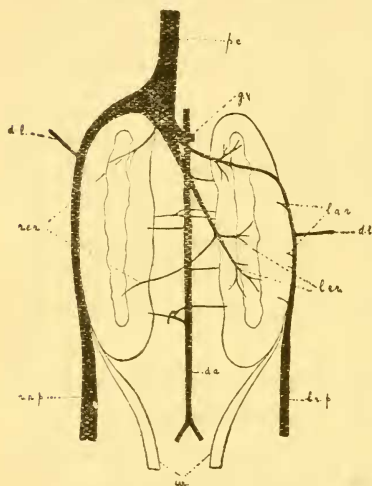


## PAPERS READ.

NOTE ON AN ABNORMAL CONNECTION OF THE  
RENAL-PORTALS IN A YOUNG MALE FROG  
(*LIMNODYNASTES PERONII*).

BY JAS. P. HILL, F.L.S.

In this specimen dissected in the Biological Laboratory, Sydney University, the renal-portal of each side was in direct connection with the post-caval. Each femoral vein divided in the usual way



*p.c.*, post-caval; *r.r.p.* and *l.r.p.*, right and left renal-portals; *l.a.r.*, left afferent renals; *r.e.r.* and *l.e.r.*, right and left efferent renals; *d.l.*, dorso-lumbar; *d.a.*, dorsal aorta; *g.v.*, genital vein; *ur.*, ureters.

into pelvic and renal-portal veins. The pelvics were exceedingly large, and united in the normal way to form the anterior abdominal. The renal-portal of the right side (*r.r.p.* in figure) was also very much enlarged. It passed forwards, skirting the outer dorsal border of the kidney, but instead of dying away anteriorly it was continued on as a well-marked vessel which passed round the anterior border of the kidney and became continuous with the post-caval. No afferent renal vessels could be made out either in the fresh state or after injection, and sections of the kidney also failed to

reveal their presence. The renal-portal of the left side (*l.r.p.*) was a much smaller vessel and more normal in appearance. It passed along the outer border of the kidney of that side in the usual way,

giving off a number of afferent renal veins (l.a.r.). Its anterior end, however, was continued as a small vessel which passed across the ventral surface of the kidney a short distance from its anterior end. It received two small factors from the kidney and then entered the post-caval some distance behind the point of union of the right renal-portal with that vessel.

The inter-renal portion of the post-caval was singularly asymmetrical. Instead of lying medianly between the two kidneys and arising from two sets of symmetrically disposed efferent renal vessels, it took its origin from the ventral surface of the left kidney, some distance from its posterior end, receiving as it passed obliquely forwards over the ventral surface, several small efferent renal vessels (l.e.r.) from the kidney substance. The efferent vessels from the right kidney (r.e.r.) were represented by, at the most, two vessels; of these the anterior one entered the post-caval opposite the point of union of the left renal-portal with that vessel. The posterior one joined the post-caval at the point where it left the ventral surface of the left kidney.

On the right side the vessel bringing back the blood from the dorsal body wall passed back obliquely and entered the renal-portal some distance behind its connection with the post-caval. On the left side the corresponding vessel entered the renal-portal, about the level of the middle region of the kidney, the more usual condition. The blood from the testes and fatty bodies entered the post-caval by a well-marked vessel (g.v.) just in front of the point of union of the left renal-portal with the post-caval.

Taking into consideration the great size of the pelvis and of the right renal-portal, the absence of right afferent renals and the small size of the inter-renal part of the post-caval, very little blood seems to have passed through the kidneys, and especially through the right one, the greater part of the blood from the posterior extremities passing into the enlarged pelvis, part also passing along the right renal-portal directly into the post-caval. The blood-supply of the left kidney seemed more normal, since distinct afferent renals were present, and since the afferent renals

which in great part made up the inter-renal portion of the post-caval arose from it.

This connection of the renal-portals with the post-caval has some significance from a developmental point of view. Hochstetter has shown\* that the post-caval vein of amphibia is to be regarded as a compound vessel and due to the fusion of an unpaired pre-renal portion formed independently of the cardinals, with an inter-renal portion formed by the fusion of the posterior portions of the posterior cardinals; and he figures the stages in the development of these and other parts of the venous system in *Salamandra atra*. In the youngest condition the posterior cardinals are shown as arising from the bifurcation of the caudal vein. Then in the region of the kidneys the cardinal of each side splits into a loop of two longitudinal vessels. On the fusion of the undivided portions of the cardinals anterior to the kidneys, the two inner vessels lose their posterior connection and form, together with the fused cardinals, the inter-renal portion of the post-caval. The outer limbs of the two loops lose their anterior connection with the cardinals and form two longitudinal vessels (Jacobson's veins), which constitute the renal-portals. Jacobson's veins are later joined posteriorly by the iliacs in the frog, and the renal-portal of the adult is thus constituted.

The condition in the specimen under consideration is thus seen to be due to the persistence in the adult of the original anterior connection between Jacobson's veins and the posterior cardinals, now fused to form the posterior part of the post-caval.

Howes has described† a specimen of *Rana temporaria* in which the anterior portion of the posterior cardinal persisted on the left side, forming an azygos vein, with which the renal-portal of that side was in direct communication. In my specimen no traces of azygos veins were present, and since it shows in the adult the persistence by arrested growth of a condition usually passed through in the larval state, I have thought it worth recording.

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\* Morph. Jahrb. Bd. xiii. p. 160.

† Proc. Zool. Soc. Lond. 1888, p. 122.